

⑫ **EUROPEAN PATENT APPLICATION**

⑰ Application number: 81830029.5

⑸ Int. Cl.³: **A 41 H 3/00, A 41 H 43/00,**
B 43 L 13/02

⑱ Date of filing: 27.02.81

⑳ Priority: 19.03.80 IT 2121780 U

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㉓ Date of publication of application: 30.09.81
Bulletin 81/39

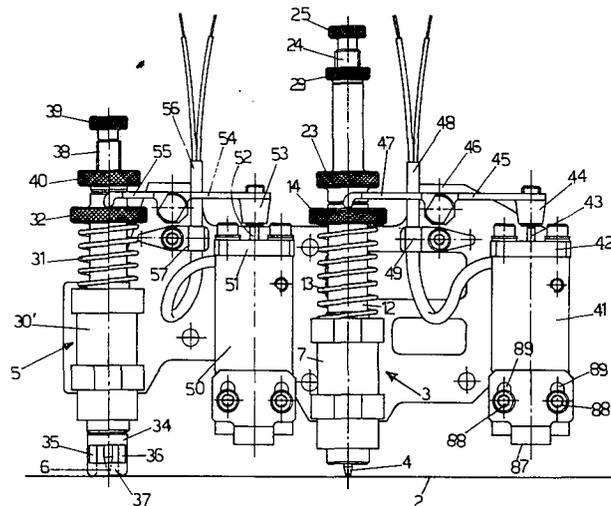
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㉔ Designated Contracting States: **AT CH DE FR GB LI NL SE**

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⑤ Head for plotting machines able to selectively plot and cut from sheets figures memorized by a computer.

⑤ This invention relates to a head for plotting machines able to trace out figures memorized by a computer and is provided, besides a writing pen (4), with a metallic cutting point (6) suitably spaced from said writing pen and perpendicular to the working plane, said writing pen and said metallic cutting point being provided with respective devices for locking and registering the rest position of their points with respect to the working plane, control means being provided to selectively press either point toward the working plane according to whether a plot of memorized figures has to be performed on a paper sheet (2) lying on the working plane, or a cut of said memorized figures has to be performed on a sheet of paper or other suitable material.



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Head for plotting machines able to selectively plot and cut from sheets figures memorized by a computer.

The present invention relates to a head for plotting machines, able to selectively plot and cut from sheets figures memorized by a computer.

5 Machines able to plot in a plane figures memorized by a computer are well known; they are essentially made of a motorized cross-bar sliding parallel to itself on a work
ing plane and of a carriage sliding along this cross-bar and carrying a head provided with a writing pen which is
10 pressed and forced to run on a sheet of paper laid on the working plane. The movements of the cross-bar and of the carriage are controlled by the computer so that the movement of the writing pen is given by the correct combination of the two perpendicular movements of the cross-bar
15 and of the carriage.

These machines are particularly used in designing models of dresses of various types, memorized by the computer in the different proposed sizes, or in plotting shapes or
20 profiles for any possible use. To this purpose the paper

on which the plot has to be made is unwinded from a roll and is intermittently advanced in pieces of length sufficient to cover the machine working plane; at the same time the plotted pieces are rewinded.

5

Besides graphical reproduction of models, for particular it has become necessary to dispose of models or figures cut from a sheet more rigid than the normally used paper. Until now the production of models has been accomplished by hand-
10 cutting the designed profiles or by using other machines which utilize a metallic point working by pressure on a plastic sheet, or a biting point, or a vibrating point.

These solution, however, require considerable costs in
15 equipment, raw materials and labour, because these machines must be constantly assisted by qualified personnel and because they do not allow the optimized profiles distribution so as to completely utilize the working area.

20 The present invention relates to a head which allows the use of a plotting machine also to cut memorized figures from a sheet of plastic or any other suitable material, in real or reduced size, taking advantage of all the main features of a plotting machine such as: complete automation of the process and maximum
25 use of the working area while saving in equipment because of the use of the same machine for plotting and cutting.

This head is characterized by having:

- a writing pen and a cutting metallic point, suitably
30 spaced one from the other, with their axis parallel and

- 3 -

perpendicular to the working plane;

- related devices to block and calibrate the rest position of the writing pen or the cutting point with respect to the working plane;

5 - command devices to selectively press either the writing pen or the cutting point toward the working plane, according to whether a plot of memorized figures has to be performed on paper or a cut of memorized figures has to be performed from a semirigid sheet of suitable material;

10 - additional devices to obtain the sheet advancement on the working plane, to complete the cut of figures occupying the working area.

15 In this way it is possible to reproduce semirigid profiles in real size, which are of immediate application, at a paltry cost, and with a production speed that only can be given by a computer controlled machine.

20 The present invention is illustrated in the enclosed drawings, in which:

figure 1 is a front view of the head;

figure 2 is a plan view of the head;

25 figure 3 is a lateral view taken from the left side of figure 1;

figure 4 is a lateral view taken from the right side of figure 1;

30 figure 5 is a sectional axial view showing the supporting and guiding devices of the cutting point;

figure 6 is a sectional view showing the supporting and guiding devices of the writing pen;

figure 7 is a front view of one of the devices for gripping and advancing the sheet for the profiles to be cut;

5 figure 8 is a sectional view taken on line A-A of figure 7;

figure 9 is a plan view with a section taken on line B-B of figure 8.

10 Figures 1 and 2 show the complete head: this head includes a supporting plate 1 intended to be assembled on a carriage, not shown, sliding along a mobile cross-bar as in all other well-known plotting machines. The movements of the cross-bar along the working plane of the machine and of the carriage along the cross-bar are controlled by a computer as
15 desired. The plate carries a device 3 which supports, calibrates, and guides a writing pen 4 and a device 5 which supports, calibrates and guides a cutting point 6. These devices 3 and 5 are shown, as well as in fig.1, also in fig. 6
20 and 5 respectively.

As shown in figures 1 and 6, the device 1 is made of a reinforcement 7 fixed to the supporting plate 1 by means of the sheds 8 and 9 and the pins 10 and 11 respectively. The
25 reinforcement 7 acts as a guide to a vertical sleeve 12 crossing the reinforcement itself and elevating above it so as to be backed up by a return spring 13 surrounding the sleeve 12 and arranged between the reinforcement 7 and an end collar 14 of the sleeve itself. The part of
30 the sleeve crossing the reinforcement 7 is provided with

a bush 12' made of a more valuable material finished more precisely to eliminate possible gaps.

5 The writing pen 4 is of a pressurized ball type and is placed at the end of a reservoir 15 shaped as a stem inferiorly prolonged by a thinner part 16.

10 The internal hole of the sleeve 12 has superiorly a larger diameter and it is threaded for a certain part, while inferiorly presents a narrowing 17 followed by a last enlarged part 18 in which a bush 19 of unwearable material is fitted. The bush 19 is provided with a hole 20 coaxial with the narrowing 17 so that it is possible to house and hold in it the thinner part 16 without gaps and with the
15 point 4 protruding below the bush 19.

Above and coaxial with the sleeve 12 is spaced a cylindrical element 21, internally hollow, screwed to the sleeve by means of the threaded end 22. In correspondence
20 to this end 22, the internal cavity gets narrower to fit around the reservoir or stem 15 so as to align it on same axis with respect to the sleeve 12.

25 Superiorly the cylindrical element 21 is closed by a calibration screw 24 which penetrates in it and can be regulated by means of a shagreened head 25. In this way it axially presses as necessary a helicoidal spring 26, internal to the cylindrical element 21 and acting on a floating piston 27 which leans on the superior end of the reservoir
30 15.

In the first place this arrangement allows the reservoir 15 to slide until it leans to the shoulder 28 offered by the opening of the narrowing 17. This determines the protruding length of the writing pen 4 so that the latter, at rest, is positioned at a very short distance from the working plane. Secondly, an elastic axial thrust is transmitted to the writing pen which allows it to exert a predetermined pressure on the working plane which guarantees the tracing of solid and uniform lines of the prot to be performed when the pen is lowered in working position.

The calibration of the screw 24 is stabilized by a shagreened ring nut 29 which spins around the screw 24 and is blocked against the upper border of the hollow cylindrical element 21.

From the previous description it is evident that the lowering of the writing pen 4 is obtained by lowering the sleeve 12 with respect to the reinforcement 7 in contrast with the return spring 13.

The whole calibration and support set 5 of the cutting point 6 is better shown in figures 1 and 5. In this case also a sleeve 30, similar to the sleeve 12 of fig. 6, axially slides with respect to a fixed reinforcement 30', similar to the reinforcement 7 of fig. 6, and also fixed to the supporting plate 1 by identical means.

The sliding of the sleeve 30 takes place in contrast to a return spring 31 placed between the reinforcement 30' and

a collar 32 positioned at the superior end of the sleeve itself.

The cutting point 6 is obtained at the end of a cylindrical
5 steel stem 33 which is placed inside the sleeve 30 and is
coaxial with it. The stem 33 is kept in ~~axis~~ inferiorly,
by a ring nut 34 of suitable material, which is screwed
inside the sleeve 30. This ring 34 is incorporated, by means
of two short legs 35 and 36 to a foot 37 positioned in
10 such a way as to lap the working plane 2 and to keep, at
rest, the cutting point 6 at a very short distance from
the plane itself.

Superiorly the stem 33 is fixed to a coaxial calibration
15 screw 38 which penetrates inside the sleeve 30. The
registration of the screw 38 allows to position the cut-
ting point 6 with respect to the working plane and to sup-
ply the stem 33 with a rigid shoulder which makes easier
the operation of the cutting point 6 when it is moved to
20 its working position. In this position, the cutting point
operation consists in penetrating within the thickness of
the sheet to be cut, for example a plastic sheet having a
suitable rigidity, to produce in it deep tracks delimiting
the memorized profiles to be cut, so that the latter are
25 easily separated once they are removed from the working
plane. Due to these tracks which allow a connection to the
main sheet, the separation of the profiles can be perform-
ed even later or in another place, because the sheet thus
traced can be rewinded in rolls, stocked or transported.
30 The calibration position of the screw, moved by its

shagreened head 39, is stabilized by the blocking ring nut 40 which comes to grip against the superior border of the sleeve 30.

- 5 The devices used to selectively bring in working position the writing pen and the cutting point are shown in figures 1 to 4.

An electromagnet 41 fixed to the supporting plate 1 by
10 means of a square bar 42 cooperates with the set 3. The mobile magnetic core of the electromagnet 41, protruding upward in 43, constitutes, at rest, a stop to one end 44 of a rocking lever 45, whose fulcrum is a pin 46, and whose other end 47 is forged as a fork. The jaws of this fork
15 lay on the back of the collar 14, in positions diametrically opposed with respect to the axis of the whole set. The electromagnet 41 is electrically supplied by a cable 48 fixed to the supporting plate 1 by means of a clamp 49.

20 In a similar way, a relevant electromagnet 50 fixed to the supporting plate 1 by means of square bar 51, cooperates with the whole set 5. The mobile magnetic core 52 of the electromagnet 50 protrudes, at rest, above the square bar 51 and constitutes a stop to one end 53 of a relevant rock
25 ing lever 54 whose other end 55 is forged as a fork and whose jaws press against the collars 32 of the sleeve 30. The electromagnet 50 is electrically supplied by a cable 56 fixed to the supporting plate 1 by means of a clamp 57.

30 On the frame 86 of the electromagnet 41 is fixed a flat

spring 87, folded below the electromagnet itself: the fixing is obtained by means of the screws 88 which thread into the frame 86 and pass through the prolonged holes 89 of the spring itself. This arrangement allows to calibrate the
5 position of the flat springs 87 so that it supports the core 43, when the electromagnet is de-energized, in an axial position in which it will be subjected to the maximum attractive force at the moment of activation: thus the core will overcome the opposition of the spring 14 and will
10 ensure to the sleeve 12 an excursion of movement such as to guarantee the contact of the writing pen 4 to the working plane even in case of roughness of the working plane itself or in case of variation in distance between the reinforcement 7 and the working plane.

15

A further function of the spring 87 is that of supporting the electromagnet core, at rest, in such a way that the latter can support the end 44 of the lever 45 to counterbalance the attraction of the spring 13.

20

Correspondently the electromagnet 30' supports a similar spring 90, also adjustable, and so arranged as to constitute both a positioning and supporting element to the core 52, performing, through the lever 59, the same functions indicated for the spring 87.
25

The electromagnets 41 and 50 are selectively and alternatively excitable, according to whether the writing pen 4 or the cutting point 6 are to be moved into working position. The selection can be manually performed, for example
30

by means of the relevant circuit breaker which interrupts the supplying cables 48 and 56, or by means of a switch. The selection can also be performed automatically for example by means of a computer, at the moment in which the execution of a plot or of a profile cut is programmed.

Whatever the solution chose, the excitation of the selected electromagnet (41 or 50) causes the lifting of the relevant mobile core (43 or 52), so that the fork (47 or 55) of the rocking lever presses on the collar (14 or 32) producing the lowering of the relative sleeve (12 or 30) and with this action also the lowering of the respective point (4 or 6) on the working plane.

Figures 7 to 9 show one of the devices to grip the sheet to be cut for its intermittent advancement: this device can operate in combination with the head described in the proceeding figures, when the latter is prearranged for profile cutting.

The mechanism is made of two symmetrical devices, arranged at the two ends of a dragging crossbar and of which therefore only one device will be described. This device is made of a strong frame with a stirrup shape, having an end wall 56 and two straight side walls 57 and 58 which extend horizontally so as to determine a cavity opened toward the bottom. The end wall 56 of this frame is provided with a dovetail guide 59 with a vertical axis, able to mate with a corresponding slide 60 presented by a plate 61: this plate is fixed by the pins 62 and 63 on the vertical side of the dragging crossbar 64, disposed transversal

ly to the machine working plane 2.

Laterally to the sidewall 58 of the frame 56 a plate 65 is fixed, for example by means of the pins 66 and 67,
5 which extends toward the bottom with a horizontal sliding block 68 which interposes itself between the working plane 2 and the lateral border of the sheet 69.

Superiorly the stirrup-shaped frame is covered by a strong
10 horizontal plate 70 which protrudes backward stretching above the supporting plate 61. The plate 70 is fixed to the frame by means of the vertical pins 71 and in the back is provided with a vertical grain 72 protruding below
15 61: in this way the calibration of the grain 72 allows the regulation of the frame position along the dovetail guide and thus the regulation of the position of the sliding block 68 with respect to the working plane 2.

20 A crossbar 73 is fixed by means of screws 74 on the front border of the plate 70: the former grips, between itself and the border of the plate 70, an elastic foil 75 which is cut below the plate 70 to form parallel elastic tongues
25 76. These tongues 76 can be as many as desired, although in figure 7 only three of them are shown. In any case they are arranged in the cavity delimited between the end wall 56 and the side walls 57 and 58 of the stirrup-shaped frame.

30



ed vertically is positioned: all the blocks are articulated on a common horizontal bar 78 sustained between the two sidewalls 57 and 58. Behind the blocks 77 a shaft 79 having a semi-circular section is arranged, whose diametrical
5 plane side acts as a support to the blocks: its position is so arranged as to maintain these blocks in a position slightly inclined with respect to a vertical line and in such in a way that the relevant elastic tongues 56 press the blocks against this face.

10

From the lower ends of the blocks 77 relevant sharp points 80 protrude: the protrusion is such that, in the position allowed by the shaft 79 and under the pressure of the elastic tongues 76, these points penetrate into the sheet
15 69, eventually entering the respective slots 81 provided in the sliding block 68.

The shaft 79 protrudes from one of the sidewalls of the frame 56 in order to present a cap 82 fixed to the grain
20 83, from which a wing 84 is also protruding. This wing, at rest, lies on a stop 85 having the shape of a pin protruding from the adjacent sidewall. When it is necessary to draw the points 80 out of the working plane, for example to handle the sheet to be cut or to hand-operate the drag-
25 ging crossbar, the wing 84 is rotated toward the top dragging the shaft 79 which, acting as cams, lifts the blocks 77 and thus the points 80. The angular orientation of the supporting plane, moreover, gives to the blocks 77 the inclined position sufficient to the points to penetrate
30 into the sheet lying on the sliding block 68, and also a

shoulder to the same blocks to limit the penetration of the points 80.

Evidently the device of figures 7, 8 and 9 is provided at
5 each end of the dragging crossbar.

With this arrangement, when a profile cutting operation is completed on a piece of sheet lying of the working plane with the procedure previously described, the cross-
10 bar 64 is moved above the completed piece toward the unwinding roll, that is to the right in the example of fig. 8. The inclination in the opposite direction of the points 80 allows the latter to rise from the sheet, winning the pressure of the tongues 66, so as to slide on the sheet.

15

When the crossbar 64 has covered the entire completed piece of the sheet, its movement is inverted. The points 80 are forced to penetrate immediately into the sheet which is gripped and dragged along the working plane 2, un-
20 winding from the roll. In this way a new piece of sheet is laid on the working plane, while the part already treated is moved away from this plane. The latter can be rewinded on a role to be stocked or transported, or can be subjected to immediate separation of the cut profiles.

25

Of course the dragging crossbar 64 will be moved by its own means acting in synchronism with the machine operation, with a manual command or with a program controlled by the computer.

30

It is evident that the invention can be embodied in forms different from the above-illustrated one, without being for this reason substantially different from the present model.

Claims

1. A head for plotting machines, able to selectively plot and cut figures memorized by a computer, characterized: by
5 having a writing pen and a metallic cutting point suitably spaced one from the other and with their axis parallel and perpendicular to the working plane; by having related devices to block and register the rest position of these points with respect to the working plane; by having com-
10 mand devices to selectively press either point toward the working plane according to whether a plot of memorized figures has to be performed on paper or a cut of memorized figures has to be performed on a sheet of suitable material; by having additional devices to obtain the sheet advance-
15 ment on the working plane at the end of the cut of a piece previously lying on the same plane.

2. A head as in claim 1, in which the writing pen and the cutting point are arranged at the inferior ends of two
20 stems, the stem of the writing pen acting also as ink-pot; these stems are arranged and calibrated within the related sleeves sliding with respect to their supports and returned in rest position by suitable springs; command devices are provided which act axially on these sleeves so as to
25 press selectively either one of the points toward the work-
ing plane.

3. A head as in claims 1 and 2, in which the selective com-
mand devices to press each point toward the working plane,
30 consist of related electromagnets separately excitable,

whose relevant core, during the excitation period, acts at the end of a rocking lever, whose other end engages the sleeve blocking the respective point; these electromagnets are remotely excitable by means of a circuit
5 breaker or a switch or through the computer controlling the plotting machine.

4. A head as in claim 1, characterized by the fact that, during the cutting period of the memorized profiles on the
10 plastic sheets, it is combined with carrying devices placed at the two ends of the crossbar sliding on the working plane, able to grip the sheet lateral borders at the end of each cutting cycle and to advance the sheet of a length sufficient to cover the entire working plane area.

15
5. A head as in claims 1 and 4, in which each mentioned carrying device is provided with parallel points connected to a horizontal bar and kept against a supporting plane by the relevant elastic tongues: these points are inclined
20 with respect to the working plane so that they rise from the sheet surface, overcoming the elastic force of the tongues when the device covers the sheet in a direction opposite to that of advancement and they penetrate into the sheet in order to drag it when the device covers the
25 sheet in the direction of advancement.

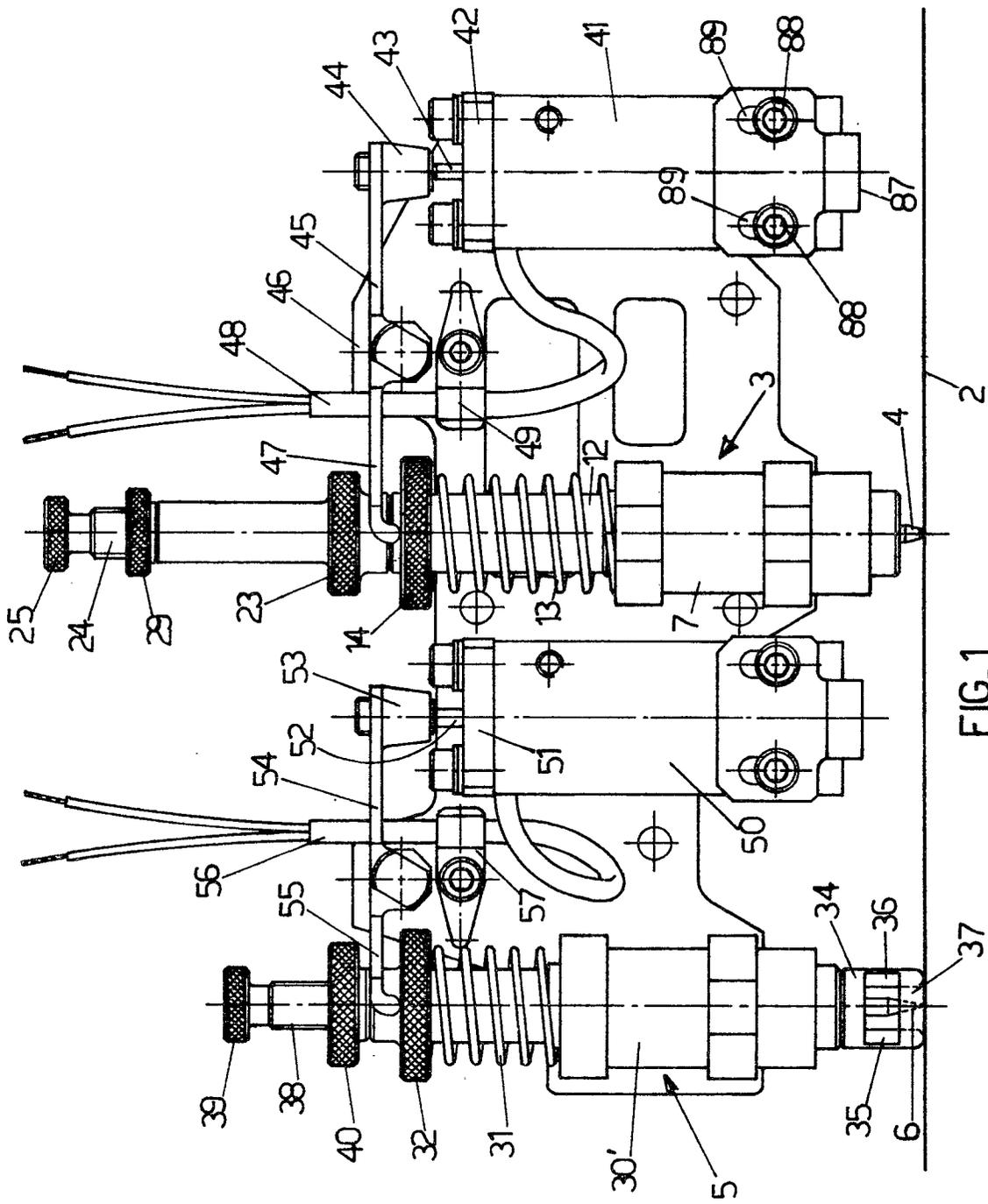


FIG. 1

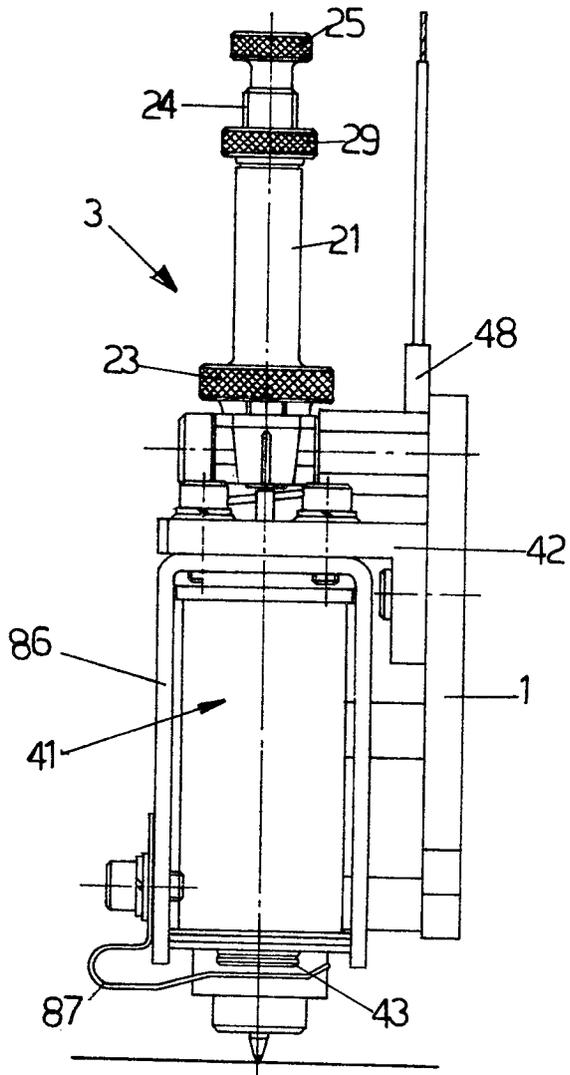


FIG. 4

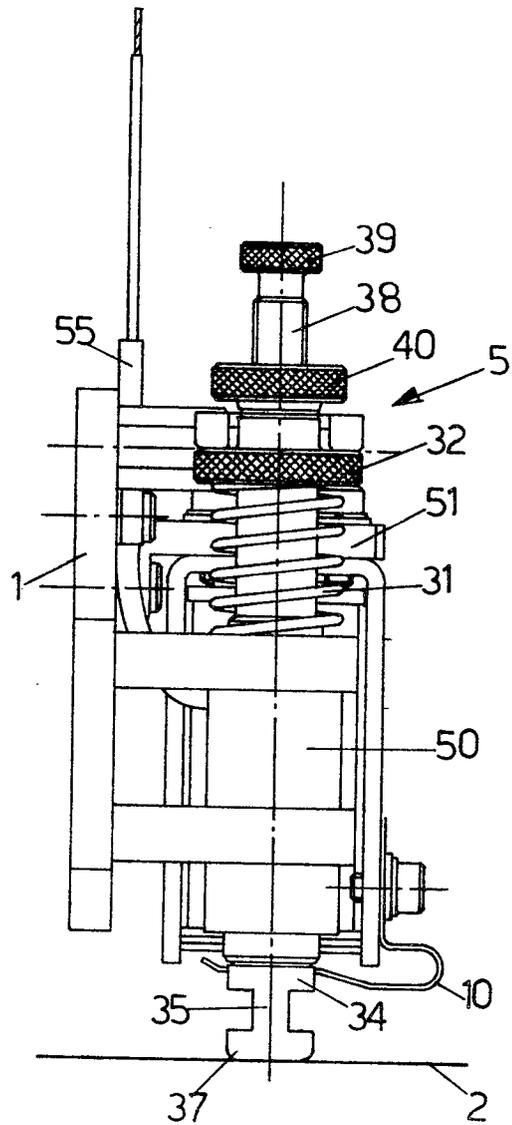


FIG. 3

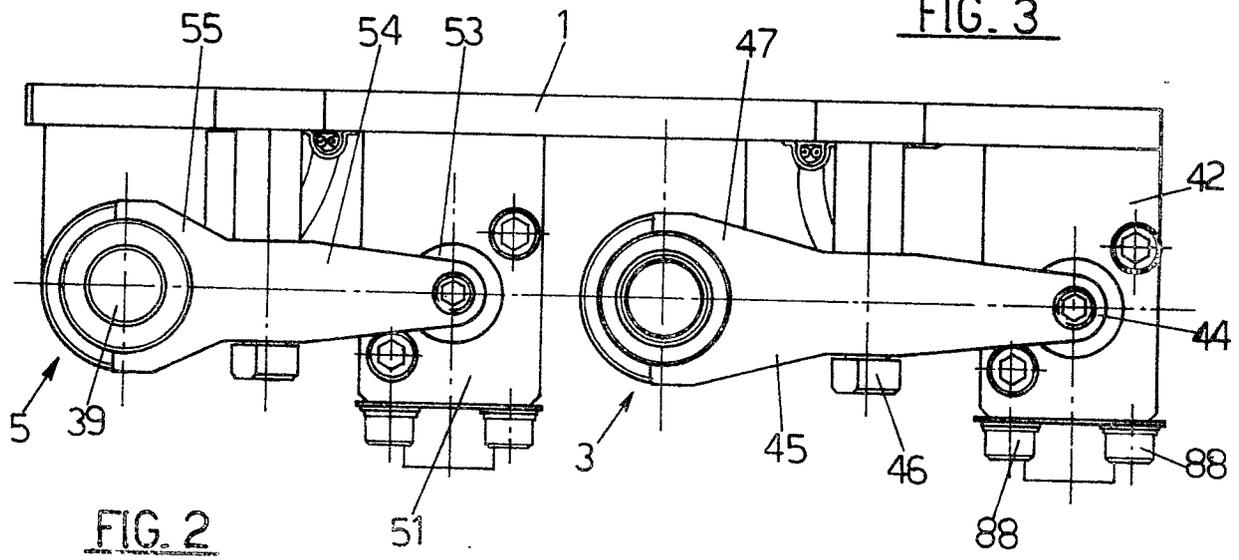


FIG. 2

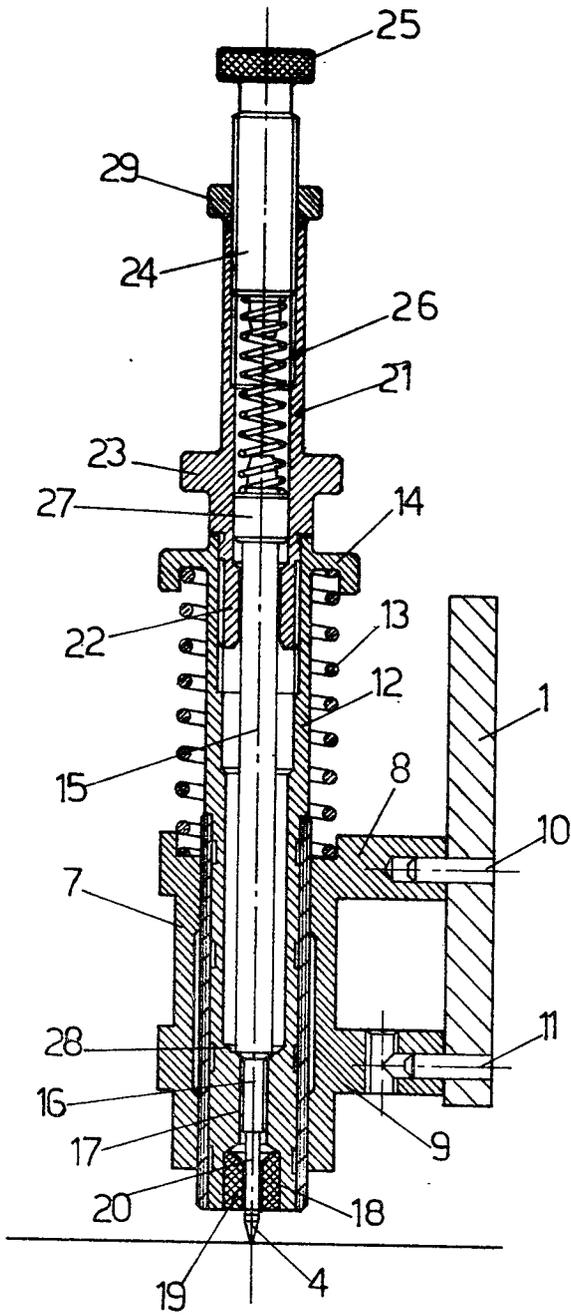


FIG. 6

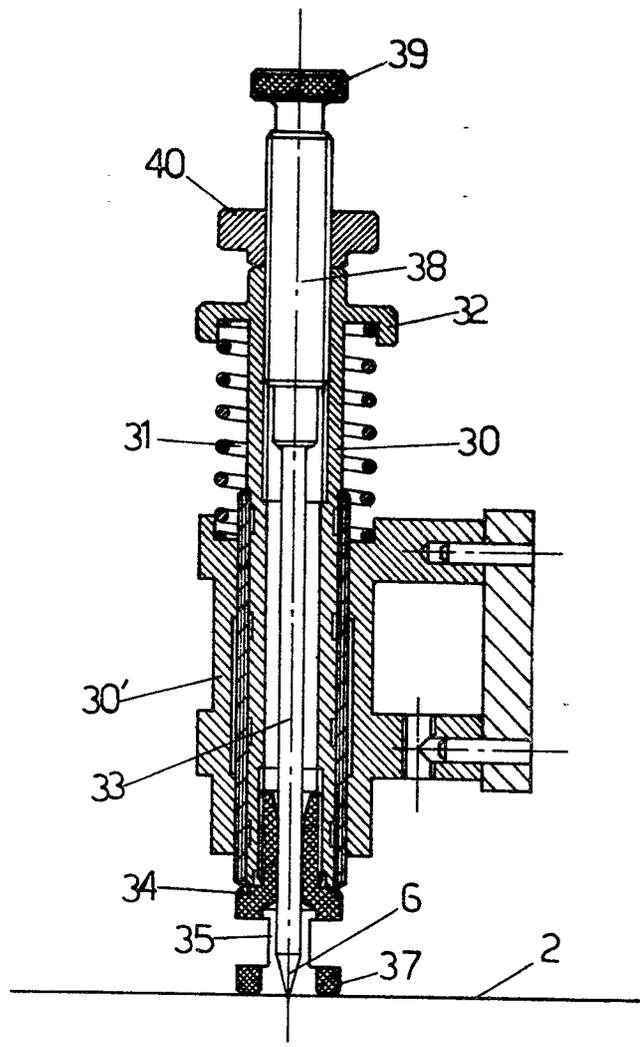
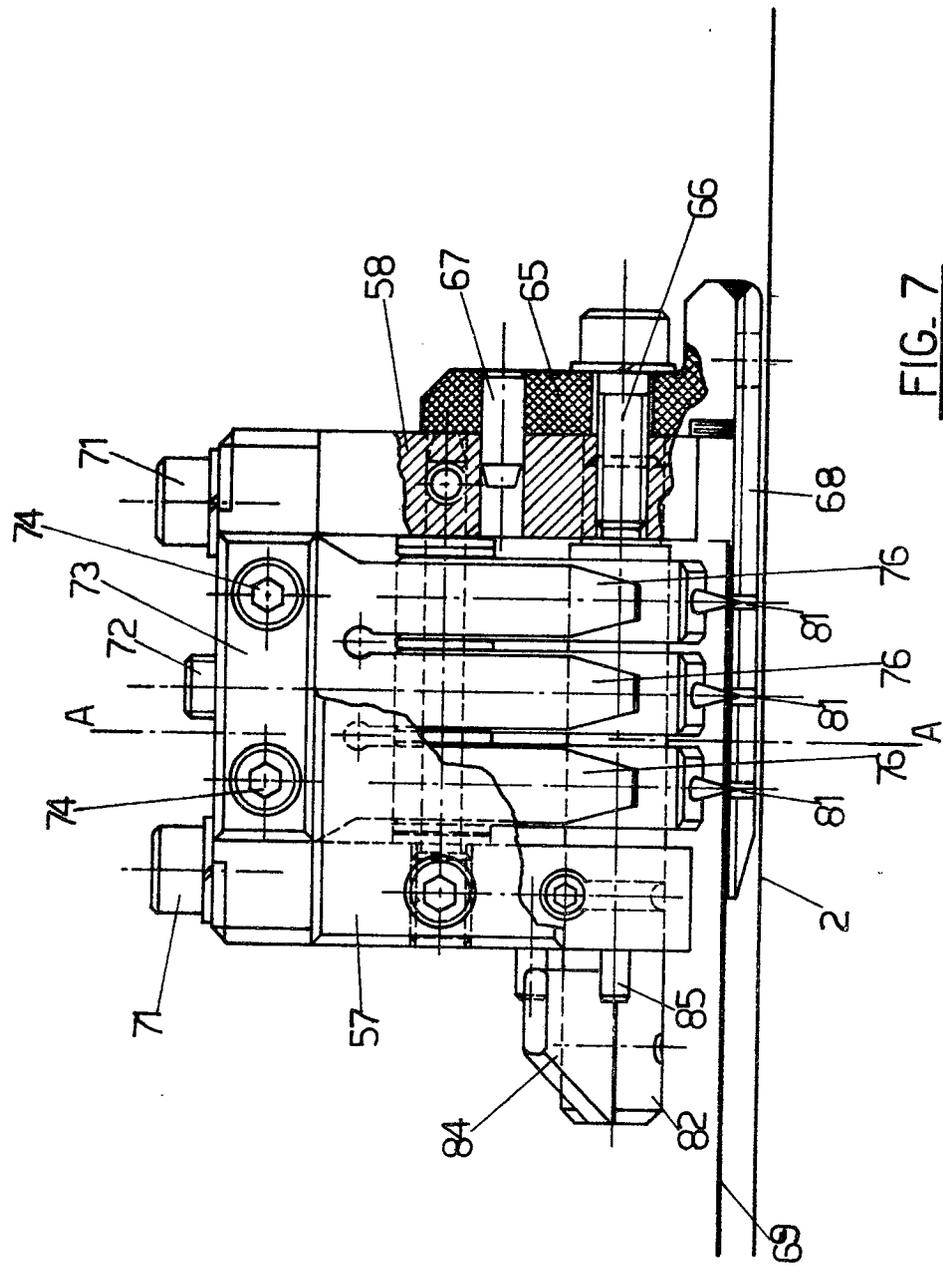


FIG. 5



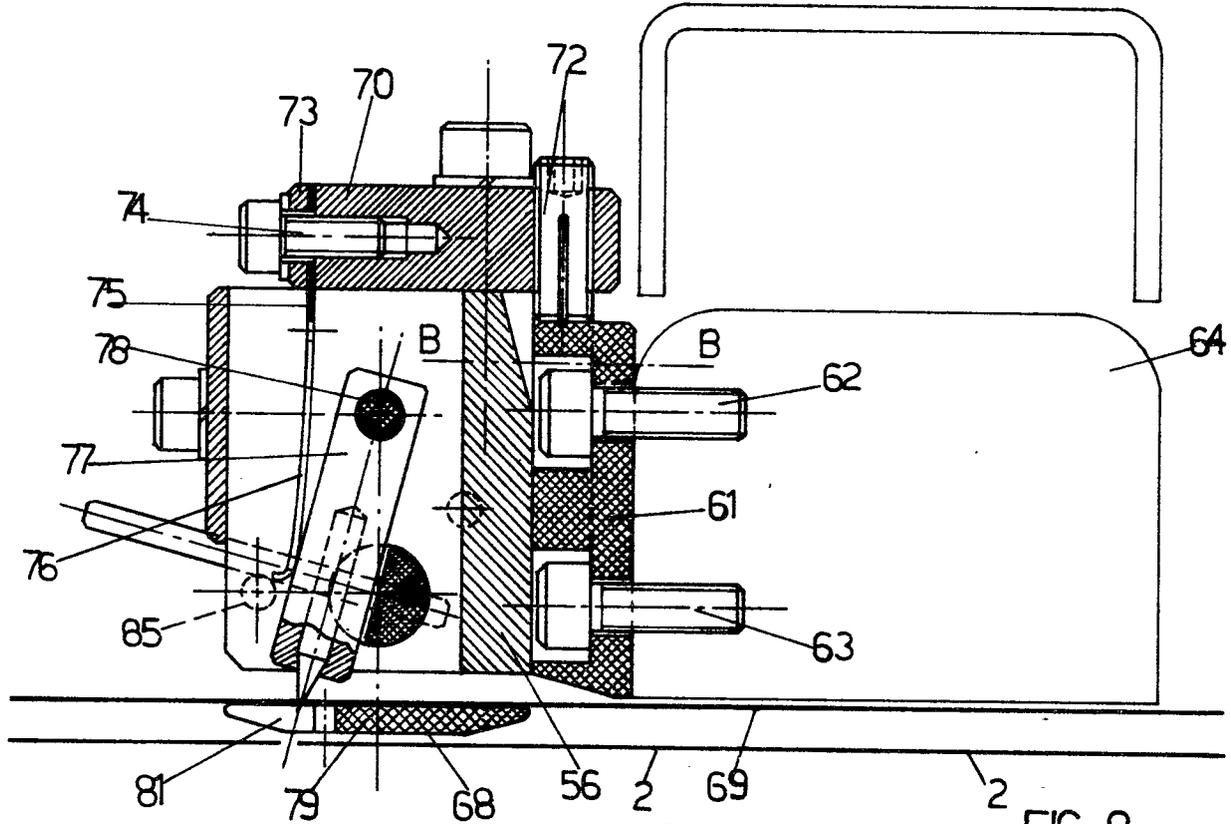


FIG. 8

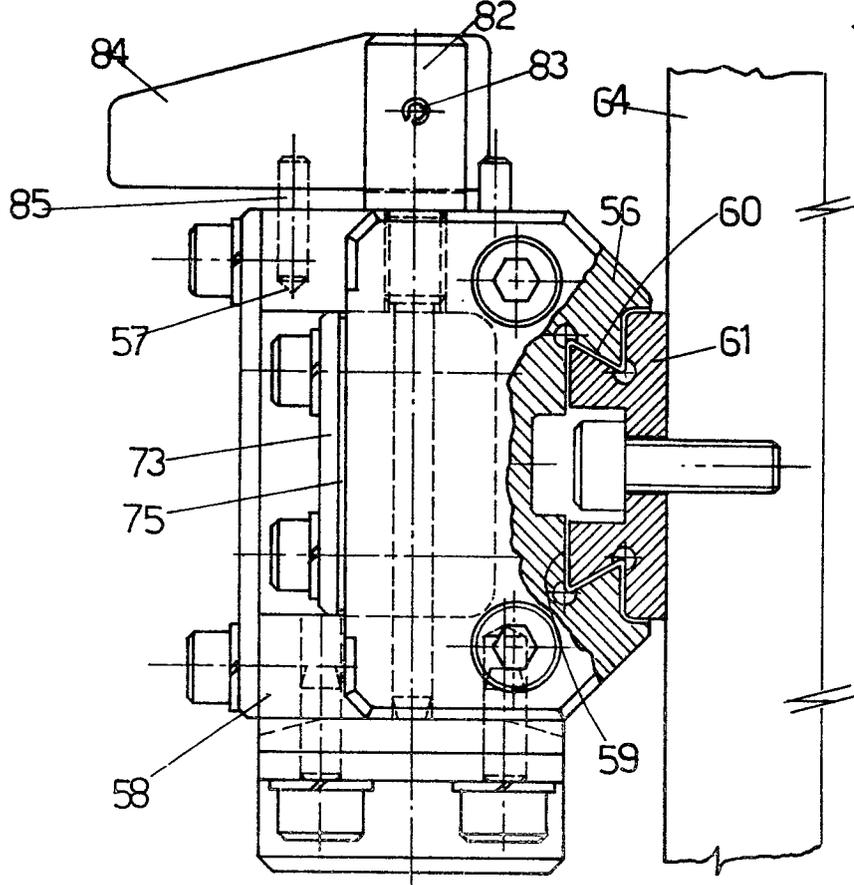


FIG. 9



DOCUMENTS CONSIDERED TO BE RELEVANT		CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)	
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
	<p><u>GB - A - 1 251 395</u> (THE CINCINNATI MILLING MACHINE CO.)</p> <p>* The whole document *</p> <p>--</p> <p><u>US - A - 3 230 925</u> (KRAUSS & REICHERT)</p> <p>* The whole document *</p> <p>--</p> <p><u>US - A - 3 991 706</u> (GERBER GARMENT TECHNOLOGY INC.)</p> <p>* Column 1, 1st paragraph; column 2, lines 67 and 68; column 3, lines 1-58; column 5, lines 19-35; claim 1; figures *</p> <p>--</p> <p><u>FR - A - 2 122 202</u> (GERBER GARMENT TECHNOLOGY INC.)</p> <p>* Page 11, last paragraph; page 12, lines 1-18; figure 9 *</p> <p>& GB - A - 1 355 410</p> <p>--</p> <p><u>DE - A - 2 228 455</u> (LICENTIA PATENT-VERWALTUNGS GmbH)</p> <p>* Page 4, last paragraph; page 5, entirely; page 6, 1st and last paragraphs; page 7, entirely; page 8, paragraphs 1 and 2; claims; figures *</p> <p>--</p> <p style="text-align: right;">./.</p>	<p>1</p> <p>1</p> <p>1</p> <p>1</p> <p>2,3</p>	<p>A 41 H 3/00 43/00 B 43 L 13/02</p> <p>TECHNICAL FIELDS SEARCHED (Int. Cl.³)</p> <p>A 41 H B 43 L B 26 F D 06 H</p> <p>CATEGORY OF CITED DOCUMENTS</p> <p>X: particularly relevant A: technological background O: non-written disclosure P: intermediate document T: theory or principle underlying the invention E: conflicting application D: document cited in the application L: citation for other reasons</p> <p>&: member of the same patent family, corresponding document</p>
<p>X The present search report has been drawn up for all claims</p>			
Place of search	Date of completion of the search	Examiner	
The Hague	29-06-1981	GARNIER	



DOCUMENTS CONSIDERED TO BE RELEVANT			CLASSIFICATION OF THE APPLICATION (Int. Cl. ³)
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	
A	<p><u>US - A - 4 091 980</u> (GERBER SCIENTIFIC INSTRUMENT COMP.)</p> <p>-----</p>	4,5	
			TECHNICAL FIELDS SEARCHED (Int. Cl. ³)